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54 **Kneading machine for food products, particularly flour mixtures.**

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DE-C- 129 100
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FR-A- 820 147
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EP 0 354 190 B1

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Description

The present invention relates to kneading machines for food products, particularly flour mixtures, of the known type comprising

- a kneading bowl which is rotatable about a first substantially vertical axis,
- a kneading tool which is rotatable within the kneading bowl about a second substantially vertical axis, spaced from said first axis, and
- a counter-member supported within the bowl and separate therefrom, for creating a dough-free space in the center of the bowl when the dough is rotated by the bowl.

Kneading machines for food products which have rotatable bowls and kneading tools rotatable about vertical axes have been known and used for some time. The kneading tool is usually spiral-shaped and machines of this type are commonly known as spiral kneading machines. In the spiral kneading machines of conventional type, the rotation of the bowl gradually brings the various portions of the dough into correspondence with the spiral kneading tool which is supported for rotation about a vertical axis spaced from the axis of rotation of the bowl. The direction of the rotation of the bowl is identical to the direction of rotation of the kneading tool.

The kneading machines of the aforesaid conventional type have the disadvantage that they cause excessive heating of the dough with resulting physico-chemical changes in the dough which compromise the subsequent leavening and baking stages. The time required for the kneading is also relatively long and this, amongst other things, contributes to the increase in the degree of overheating of the product.

In an attempt to resolve this problem, a kneading machine for food products of the type indicated at the beginning of the present description has been proposed in the past. This machine differs from a conventional machine in that it includes a counter-member supported in a fixed position within the rotatable bowl at a certain distance from the axis of rotation of the bowl and adjacent to the kneading tool. The presence of the counter-member means that, in use, an empty dough-free space is created in the central part of the bowl, which enables greater aeration of the dough and therefore a smaller increase in temperature. At the same time, the counter-member acts as a separator for detaching from the tool any dough adhering thereto. However, such known machine, although enabling to avoid the overheating of the dough, does not ensure a satisfactory degree of homogeneity of the product such as not to give rise to problems in the subsequent leavening stage. The reason for this lack of homogeneity consists of the fact that the dough detached from the spiral kneading member by the counter-member is subjected to stretching which gives rise to unevenness in the dough.

In order to overcome the above mentioned inconvenience, the applicant has already proposed in EP-A- 315 599 (falling within the terms of Art. 54 (3) and (4) EPC and disclosing the relevant prior art), filed 3/11/87, a kneading machine of the type indicated at the beginning of the present description, in which the counter-member has a body having a continuous peripheral wall and is rotatable about a third substantially vertical axis, said kneading machine further comprising means for rotating the counter-member so that the peripheral velocity of the counter-member is equal to the peripheral velocity of the bowl in correspondence with the part of the counter-member which is farthest from the axis of rotation of the bowl. As indicated above, the counter-member acts as a separating member of the dough from the kneading tool and at the same time creates in the central part of the bowl a dough-free space when the dough is rotated by the bowl. Thus the temperature increase of the dough is kept low. At the same time, the velocity of the dough in the region between the kneading tool and the rotating counter-member is identical to the peripheral velocity of that member. The dough is thus not subjected to stretching, so that perfect homogeneity of the produce is ensured.

In order to further improve the said previously proposed machine, by reducing in particular the kneading time, the present invention provides a kneading machine of the type indicated at the beginning of the present description, characterized by the combination of the following features:

- the counter-member has a body having a continuous peripheral wall and is rotatable about a third substantially vertical axis, said kneading machine further comprising means for rotating the counter-member so that the peripheral velocity of the counter-member is equal to the peripheral velocity of the bowl in correspondence with the part of the counter-member which is farthest from the axes of rotation of the bowl,
- the kneading machine comprises at least one further kneading tool which is rotatable around a fourth substantially vertical axis.

The main advantage provided by the kneading machine according to the invention lies in its intensive kneading action which enables the kneading time to be reduced by approximately a half compared with that of conventional machines whilst also causing increased aeration of the product which resists the temperature raise.

In the prior art, there had been already proposed kneading machines comprising more than one kneading tool. For example, French patent No. 820 147 discloses a kneading machine comprising a pair of kneading tools and a central counter member. First of all, said counter-member is arranged at the center of the bowl, so that it is not able to create a dough-free space when the dough is rotated by the bowl. Sec-

ondly, the counter-member is not rotatable, so that there is not obtained the further advantage of the machine according to the invention lying in that a particularly homogeneous product is obtained. A substantially analogous structure is also disclosed in French patent No. 5495.

Summing up, none of the machines according to the prior art achieve on one side a relevant reduction of the temperature increase of the dough, due to the creation of a dough-free space at the center of the bowl, and on the other side a high homogeneity of the product, due to the rotation of the counter-member, and a very reduced kneading time, due to the use of a plurality of kneading tools.

Further characteristics and advantages of the present invention will become clear from the detailed description which follows with the aid of the appended drawings, provided by way of non-limiting example, in which:

- Figure 1 is a side view of a machine according to the invention,
- Figure 2 is a plain view of the machine of Figure 1,
- Figures 3 and 4 show schematically some elements of the machine illustrated in the preceding drawings, and
- Figure 5 illustrates schematically some variants of the kneading machine according to the invention.

With reference to Figures 1-4, a kneading machine comprises a support structure 1 to which a removable trolley 3 carrying a kneading bowl 4 can be connected by means of a hydraulic clamping system, not illustrated, operated by a hydraulic control unit 2. The support structure 1 houses a geared motor unit 5 which acts on a lower portion 9 of the bowl 4 by means of friction wheels 6 to rotate it about its vertical axis 8.

A head structure 10 is articulated to the structure 1 by means of a hinge 11. The head structure 10 is cantilevered over the kneading bowl 4 and supports two spiral kneading tools 13 for rotation about respective vertical axes 12a, 12b and a counter-member 14 which in the illustrated example has a body of cylindrical shape with a continuous peripheral wall. The tools 13 and the member 14 thus extend into the bowl 4 with their lower ends a short distance from its base.

A hydraulic cylinder 25 driven by an electric motor 16 of the control unit 2 enables the head structure 10 to be lifted from its normal working position, in which it projects over the bowl 4, to a partially-tilted position, indicated in broken outline in Figure 1, in which the kneading tools 13 and the counter-member 14 are out of the bowl 4.

An electric motor 15 rotates the tools 13 by means of transmission belts 16 which engage pulleys 17 keyed to shafts of the tools 13. The counter-member 14 can rotate by virtue of a pulley 19 keyed to its shaft

and engaged with a transmission belt 18 whose opposite end passes over a pulley 20 keyed to the shaft of one of the kneading tools 13. The diameters of the pulleys 17 and of the pulley 19 are selected so as to produce the required velocity ratio between the kneading tools 13 and the counter-member 14.

When it is wished to carry out the kneading, it is necessary to clamp the trolley 3 carrying the bowl 4 filled with dough to the support structure 1 and then to lower the head structure 10 so that the kneading tools 13 and the counter-member 14 penetrate the dough. At this point the actual kneading can be carried out by rotation of the tools 13 and of the member 14 by means of the motor 15 and the rotation of the bowl 4 by means of the motor 5.

Tests carried out by the applicant have shown that the machine causes the temperature of the dough to raise by approximately 4-5°C, whilst the time required for the operation is approximately 2.5-3 minutes, approximately half that required by a conventional machine.

Figures 3 and 4 show schematically the arrangement of the kneading tools 13 and the counter-member 14 of the machine just described.

A variant (Figure 5) is provided with three kneading tools 13 and one counter-member 14 disposed adjacent to both the kneading tools 13, although closer to one of them.

Naturally, it is possible to provide for a device for detecting the temperature of the dough continuously by means of a probe arranged in contact therewith. The temperatures detected may be displayed visually and supplied to a control system which stops the kneading machine when the dough reaches a particular temperature in order to prevent its alteration. The electric motors of the kneading machine may also be provided with a sine-wave "inverter" system with an acceleration gradient.

A continuously-increasing speed can thus be achieved during the first stage of the kneading, when the ingredients (flour, water, etc. ...) must be amalgamated, avoiding the problem of the flour escaping as a result of an unsuitable kneading speed. The operation is thus greatly improved as regards the efficiency of the amalgamation of the ingredients and the time necessary to carry it out.

Claims

1. Kneading machine for food products, particularly flour mixtures, comprising:
 - a kneading bowl (4) which is rotatable about a first substantially vertical axis (8),
 - a kneading tool (13) which is rotatable within the kneading bowl (4) around a second substantially vertical axis (12a), spaced from the first axis (8),

a counter-member (14) supported within the bowl (4) and separated therefrom, for creating a dough-free space in the center of the bowl (4) when the dough is rotated by the bowl (4), and including the combination of the following features:

- the counter-member (14) has a body having a continuous peripheral wall and is rotatable around a third substantially vertical axis, said kneading machine further comprising means for rotating the counter-member (14) so that the peripheral velocity of the counter-member (14) is equal to the peripheral velocity of the bowl (4) in correspondence with the part of the counter-member (14) which is farthest from the axis of rotation (8) of the bowl (4),
- the kneading machine comprises at least one further kneading tool (13) which is rotatable around a fourth substantially vertical axis.

2. Kneading machine as in Claim 1, characterized in that said further kneading tool is also arranged adjacent to said counter-member (14).
3. Kneading machine as in Claim 1, characterized in that all the kneading tools are driven by a single motor.
4. Kneading machine as in Claim 3, characterized in that said motor rotates also the said counter-member (14).

Patentansprüche

1. Knetmaschine für Lebensmittelprodukte, insbesondere für Mehlgemische, umfassend eine Knetschüssel (4), die um eine erste, im wesentlichen vertikale Achse (8) drehbar ist, ein Knetwerkzeug (13), welches innerhalb der Knetschüssel (4) um eine zweite, im wesentlichen vertikale Achse (12a) drehbar ist, die von der ersten Achse (8) einen Abstand hat, ein Gegenelement (14), welches innerhalb der Knetschüssel (4) so angeordnet ist, daß es diese nicht berührt und welches dazu dient, einen teigfreien Raum im Zentrum der Schüssel (4) zu schaffen, wenn der Teig durch die Schüssel (4) in Umlauf gebracht wird, umfassend die Kombination der folgenden Merkmale:
 - das Gegenelement (14) hat einen Körper mit einer kontinuierlichen Umfangswand und ist um eine dritte, im wesentlichen vertikale Achse drehbar, wobei die Knetmaschine ferner Mittel zum Drehen des Gegenelementes (14) in einer Weise hat, daß die Umfangsgeschwindigkeit des Gegenelementes (14) gleich der Umfangsgeschwindigkeit der Schüssel

(4) in Entsprechung des Teils des Gegenelementes (14) ist, der am weitesten von der Drehachse (8) der Schüssel (4) entfernt ist, - die Knetmaschine umfaßt wenigstens ein weiteres Knetwerkzeug (13), welches um eine vierte, im wesentlichen vertikale Achse drehbar ist.

2. Knetmaschine nach Anspruch 1, dadurch gekennzeichnet, daß das weitere Knetwerkzeug ebenfalls in der Nähe des Gegenelementes (14) angeordnet ist.
3. Knetmaschine nach Anspruch 1, dadurch gekennzeichnet, daß alle Knetwerkzeuge durch einen einzigen Motor angetrieben werden.
4. Knetmaschine nach Anspruch 3, dadurch gekennzeichnet, daß der Motor auch das Gegenelement (14) antreibt.

Revendications

1. Pétrin pour produits alimentaires, en particulier pour mélanges de farine, comprenant :
 - une cuve de pétrissage (4) qui peut tourner autour d'un premier axe (8) sensiblement vertical,
 - un outil pétrisseur ou bras (13) peut tourner à l'intérieur de la cuve de pétrissage (4) autour d'un second axe (12a) sensiblement vertical espacé dudit premier axe (8), et
 - un contre-élément (14) supporté à l'intérieur de la cuve (4) et séparé de cette dernière pour créer un espace libre de pâte au centre de la cuve (4) lorsque la pâte est entraînée en rotation par la cuve (4), et comprenant la combinaison des particularités suivantes :
 - le contre-élément (14) possède un corps présentant une paroi périphérique continue et peut tourner autour d'un troisième axe sensiblement vertical, ledit pétrin comprenant en outre des moyens servant à faire tourner le contre-élément (14) de telle manière que la vitesse périphérique du contre-élément (14) soit égale à la vitesse périphérique de la cuve (4) au droit de la partie du contre-élément (14) qui est la plus éloignée de l'axe de rotation (8) de la cuve (4),
 - le pétrin comprend au moins un outil pétrisseur (13) supplémentaire qui peut tourner autour d'un quatrième axe sensiblement vertical.
2. Pétrin selon la revendication 1, caractérisé en ce que ledit outil pétrisseur supplémentaire est lui aussi disposé adjacent audit contre-élément (14).

3. Pétrin selon la revendication 1, caractérisé en ce que tous les outils Pétrisseurs sont entraînés par un seul et même moteur.

4. Pétrin selon la revendication 3, caractérisé en ce que ledit moteur fait aussi tourner ledit contre-élément (14).

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FIG. 1

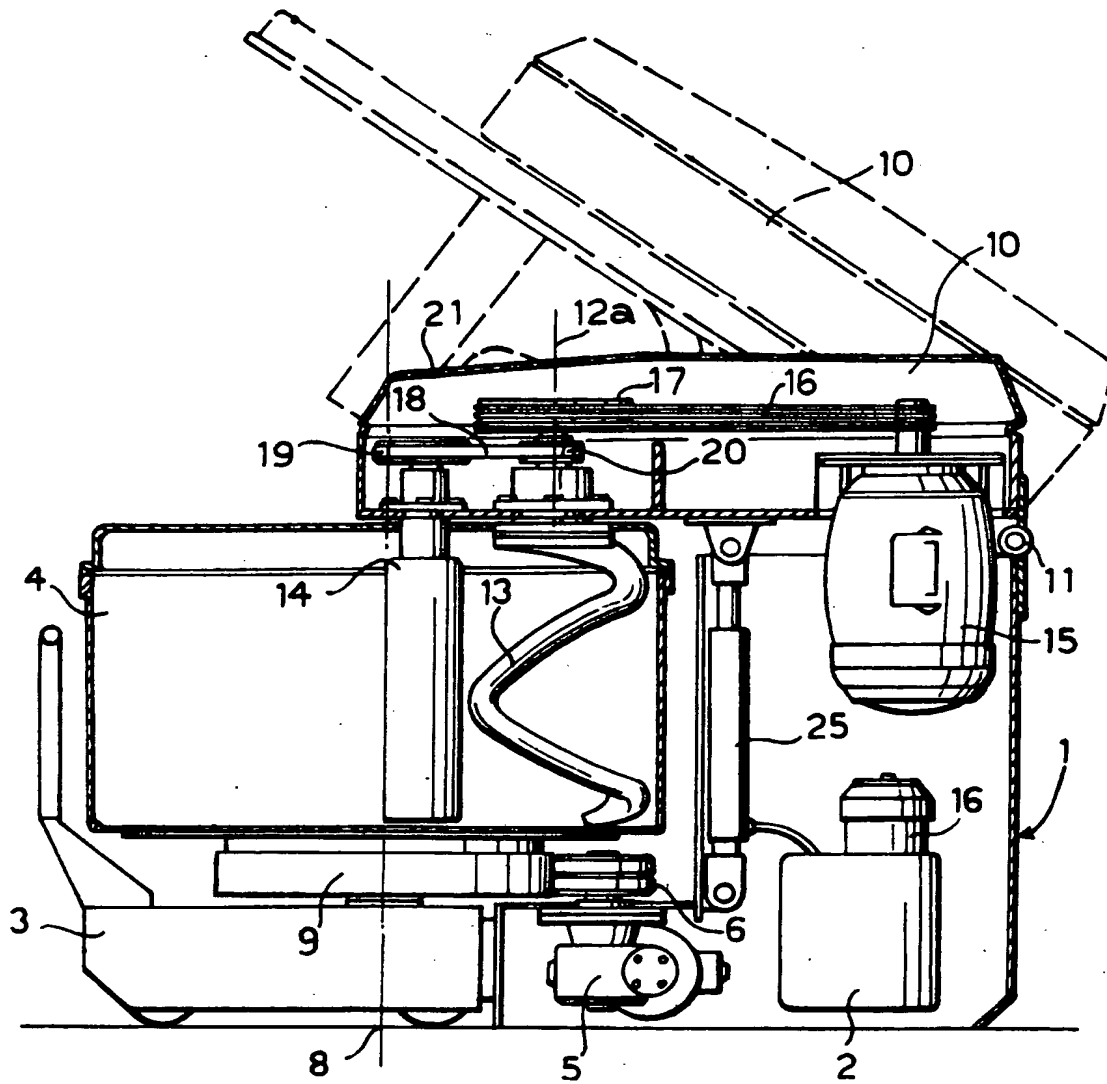


FIG. 2

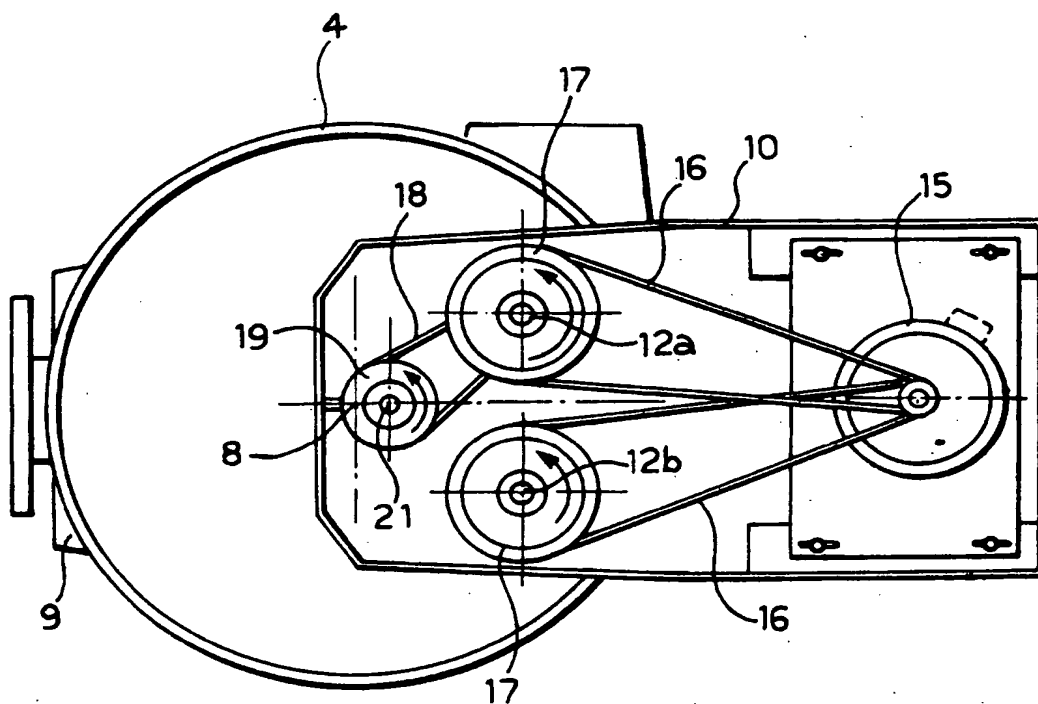


FIG. 3

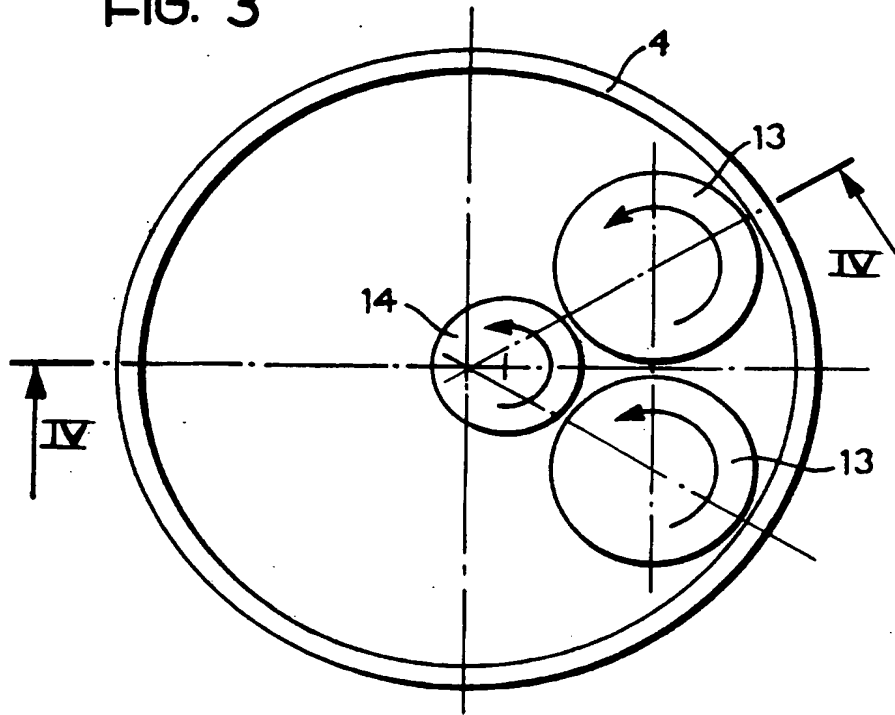


FIG. 4

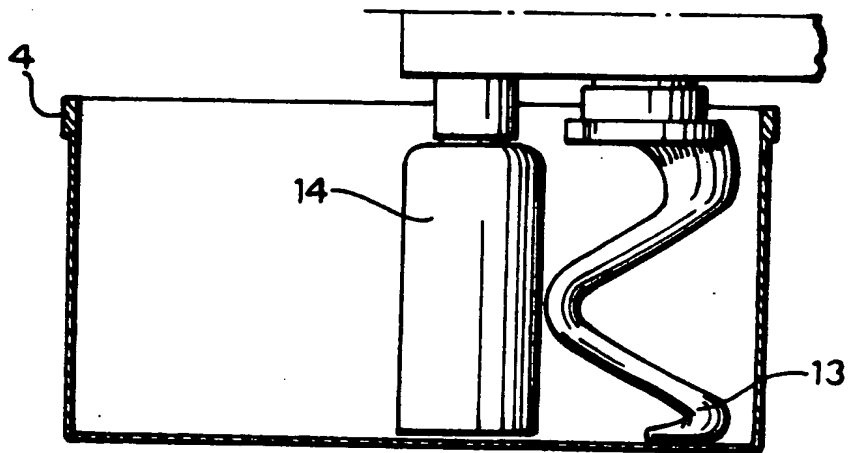


FIG. 5

